

ART. IV.—*On the Families of the Raniform Anura.*

By E. D. COPE.

It has been already pointed out\* that the families of the toothless Anura, or Bufoniformia, are distinguishable into those with the arciferous and those with the raniform types of sternum. To the first were assigned the families Rhinophrynidæ and Bufonidæ, and to the last, the Engystomidæ, Brachymeridæ, and Dendrobatidæ. Continued observation points to the radical nature of this diversity, while the increase of knowledge furnishes us with cases of rudimental dentition, indicating a less significance for the character which has been supposed to characterize the Bufoniformia. Such occurs in the genus *Colostethus* Cope, which seems to be quite identical with *Dendrobates*, except in the possession of teeth. *Microhyla*, a true Engystomatid, is said by Günther to possess teeth, and minute rugosities on the maxillæ of *Callula natatrix* deceived me into the belief at one time that teeth actually existed. Among arciferous genera *Eupemphix* Steindachner is said by him to possess very minute teeth, which in some adults are entirely wanting. I therefore incline to believe that the families of the Bufoniformia must be separated, and referred to the neighborhood of those types of Arcitera or Raniformia to which they are most nearly affined.

In reviewing the structures of the genera with raniform sternum, it appeared that the family of Brachymeridæ did not represent a natural group, embracing genera related by analogy rather than affinity. The opportunity of studying *Phrynomantis* (*Brachymerus*) afforded by the Museum Compar. Zoology, shows that it is a degraded form of those Engystomatoid genera without epicoracoid, and should be referred to the family Engystomidæ. The genera, mostly American, furnished with epicoracoid, represent the family Phryniscidæ. *Chelydobatrachus* should be referred to the Bufonidæ, and *Breviceps* is the type of a peculiar family.

The family Rhinophrynidæ will remain with the Bufonidæ in the Arciferous series, but its characters must be modified by the removal from it of the genus *Hemisus* Gthr. This is as might have been anticipated, and is the result of a different interpretation of the pieces of the scapular arch. In this genus the arch is very

\* Nat. Hist. Review, London, 1865. On the Batrachia Salientia.

oblique, the scapula and suprascapula directed forwards, and bordering closely the cranium, the latter element exhibiting the anomaly among the Batrachia, of a ligamentous articulation with the condyloid extremity of the proötic bone. If we compare with Engystomidæ, the clavicle appears to be similarly wanting, and most probably the epicoracoid (*procoracoid* Gegenbauer), while the coracoids are dilated, and abut against each other closely. The xiphisternum is slender, and attached at its posterior extremity to the similar ends of a cylindrical bone which extends posteriorly from the glenoid cavity to meet its fellow on the middle of the abdominal line. This piece might naturally be supposed to be the coracoid, especially in view of the obliquity of the superior limb of the scapular arch. Günther has apparently so identified it, by terming the anterior element the clavicle. This anterior element, however, appears in its origin, form and position, to be truly homologous with that determined heretofore to be the coracoid in the Brevicipitidæ and Engystomidæ, and, as in the latter family, the acromion projects forwards without giving rise to the clavculus, indicating that that element is absent. The posterior osseous element may then be termed the postcoracoid. If this determination be correct, the genus *Hemisis* becomes the type of a tribe (or sub-order) of equal isolation as the *Aglossa*, *Arcifera*, and *Raniformia*, which may be called the *Gastrechia*, characterized as follows:

Eustachian tubes not roofed by pterygoids, tongue present; coracoids abutting, no arched cartilages; a postcoracoid; suprascapula having a ligamentous articulation with proötic.

Should, however, the two elements to be determined to be epicoracoid and coracoid by the examination of the younger stages of the genus, it may still remain the type of a distinct tribe defined by their divergence and single cartilaginous connection, and the suspension of the scapular arch. It may be said in favor of this view, that the supposed coracoid has a short distal posterior fissure, similar to the groove of the clavculus which usually embraces the epicoracoid.

#### RANIFORMIA.

Coracoidei abutting; epicoracoidei, when present, continuous transverse, and abutting on coracoidei; not connected with the latter by overlapping longitudinal cartilages.

##### I. Bufonoid Raniformia.

No teeth on the maxillary or premaxillary bones.

Epicoracoidei present; sacrum with dilated triangular diapophyses,

confluent with coccygeal style. Two lobes of the liver, . . . . . Brevicipitidæ.

Epicoracoidei wanting; sacrum distinct from coccygeal style, with

dilated triangular diapophyses. Two lobes of the liver, . . . . . Engystomidæ.

Epicoracoidei present; sacrum distinct from coccygeal style, with

dilated triangular diapophyses. Two or three lobes of the liver, . . . Phryniscidæ.

Epicoracoidei present; sacrum distinct from coccygeal style, with cylindrical diapophyses. Three lobes of the liver, . . . . Dendrobatidæ.

II. Ranoid Raniformia.

Maxillary and premaxillary bones furnished with teeth. Fronto-parietal bones ossified above.

Epicoracoid present; xiphisternum and manubrium wanting.

Three lobes of the liver, . . . . . Colostethidæ.

Epicoracoid present; xiphisternum and manubrium present, osseous.

Three lobes of the liver, . . . . . Ranidæ.

*BREVICIPITIDÆ* mihi.

I. Prefrontals widely separated; ethmoid arch not ossified.

A fronto-parietal fontanelle; ear perfectly developed; toes free; no parotoid glands; head not distinct from body, . . . . . BREVICEPS.

BREVICEPS Merrem.

The only genus of the family, embracing three species in South and West Africa.

B. verrucosus Rapp, Erichson's Arch. f. Naturg. 1842, 289, tab.; Smith, Ill. S. Afr.; Gthr. Catal.

Habitat. South Africa.

B. gibbosus Merrem, Tent. 178; Gravenhorst; Dum. Bibr.; Smith; Günther. *Rana gibbosa* Linn. *Systema breviceps* Wagler.

Habitat. South Africa.

B. mossambicus Peters, in Wieg. Archiv. f. Naturg. 1855, 58.

Well distinguished from the preceding species.

Habitat. Mozambique.

*ENGYSTOMIDÆ* mihi.

I. Ethmoid arch not ossified; prefrontals widely separated.

A. A fronto-parietal fontanelle; terminal phalanges with transverse limb.

Ear perfectly developed; toes free; no metatarsal shovel, . . . . . PHRYNOMANTIS.

II. Ethmoid arch ossified; prefrontals fully developed, in contact with each other and fronto-parietals; latter complete.

A. Terminal phalanges with transverse limb, anteriorly at least.

"No tympanum or cavum tympani; eustachian ostia minute." Toes webbed, . . . . . MICROHYLA.

- Tympanum, cavum tympani and eustachian ostia ; toes with web or its rudiment, . . . . . CALLULA.
- AA. Terminal phalanges simple.
- Ear fully developed ; head not distinct ; membranum tympani concealed ; toes free to slightly palmate ; metatarsus with insignificant tubercles, . . . . . ENGYSTOMA.
- Ear developed, membranum tympani concealed ; toes free to partially palmate ; metatarsus with two compressed shovel-like tubercles, . . . . . SYSTEMA.
- Ear developed, membranum tympani distinct externally ; toes free ; metatarsus with insignificant tubercles, . . . . . ADENOMERA.

#### PHRYNOMANTIS Peters.

*Brachymerus* Smith (name pre-occupied), Zool. S. Africa.

*P. bifasciata* Smith. South and East Africa to Zanzibar.

*P. fusca* Peters, Monatsberichte, Berlin, 1867, 35. Amboina.

#### CALLULA Gray, 1831.

(Spelled erroneously *Kaloula* and *Culohyla*.) *Hylædactylus* Tschudi, 1838. *Plectropus* Dum. Bibr. *Holonectes* Peters, 1863.

The species of this genus in the author's estimation are—

- C. picta* Dum. Bibr. (*Plectropus*.) Philippine Islands.
- C. obscura* Günther, Rept. Brit. India. Ceylon.
- C. pulchra* Gray (*Hylædactylus*), Cantor. Ceylon, Siam, Burmah, China.
- C. baleata* Müller, Günther, Cat. B. M. Java.
- C. sundana* Peters, Monatsberichte Berl. Ac. 1867. Borneo.
- C. conjuncta* Peters (*Holonectes* Pet.), Monatsber. 1863. Steindachner Verh. Bot. Zool. Gess. Wien, 1864. Tab. Philippine Is.
- C. natatrix* Cope, sp. nov. Near Rangoon, Burmah.

This species differs from the preceding in the complete palmation of its toes, the length of its posterior extremities, and the minuteness of the ostia pharyngea, thus approximating the genus *Microhyla*, and entirely confirming the position I assigned the latter in the essay in Nat. Hist. Review (1855).

Head small, muzzle as long as orbit, obtuse, scarcely projecting beyond mouth ; canthus rostralis very obtuse. Fingers slender, free, tips truncate, scarcely dilated, a slight dermal margin. Foot large, one phalange only of longest toe free from web. Metatarsal tubercles minute ; no tarsal fold. When the hind limb is extended, the end of the muzzle falls opposite the middle of the tibia, the whole measuring twice the length of head and body in all, the longest limb among the Anura. Skin everywhere smooth. Tongue oval ; a subgular vesicle in ♂.



Length head and body 18 lines; fore limb 9·75 lines; hind limb 36 lines; foot without tarsus 9·75; tarsus 5·25; tibia 12 lines.

Above an olivaceous clay color, with a broad blackish dorsal band commencing abruptly across the interorbital space, narrowing on the scapular region, and spreading widely over the sacral region, before vanishing; a broad oblique blotch from axilla to near groin. Femora blackish marbled behind, with faint cross-bars above; tibia with some light bordered black spots on hinder margin. Foot, tarsus and forearm black below. Abdomen pale yellow; gular region thickly brown speckled. Numerous specimens in Mus. Compar. Zoology, Cambridge, from W. Theobald, Jr. (No. 630.)

This species, although presenting some peculiar features, cannot be referred to any other genus than the present one. From its structure I should suppose it to be a strong swimmer, and would express the belief that its habits are aquatic and terrestrial, like the *Acris gryllus* among Hylidæ, offering another evidence of the risk of applying physiological characters to the explanation of the system of animal structures. Callula, once held to be a tree-toad, is really more nearly allied to some ground toads, and embraces species both aquatic and terrestrial!

A similar instance occurs in the genus *Bufo*. Duméril and Bibron remark of *B. borbonicus* (*B. cruentatus* Boie) that it might as well be regarded as a tree-frog or frog as a toad. On this species Boie established his genus *Hylaplesia*, according to Prof. Peters, referring it to the tree-frogs. Günther referred this name to the genus *Dendrobates*, it appears erroneously, in consequence of which the writer re-characterized the section under the name *Adenomus*, taking as type *Bufo kelaartii*. Professor Peters still retains the genus, adding a new species, *Bufo brevipes*.\* I am, however, convinced, after a most careful study of the internal and external structure of *B. kelaartii*, and in part of *B. borbonicus*, that they do not differ from the genus *Bufo*, and that their external appearance is deceptive.

#### MICROHYLA Tschudi, Dum. Bibr., Cope.

*M. achatina* Boie (*Hylaplesia*) Tschudi. Java.

Size small; the only species. •

#### SYSTOMA Tschudi.

Batrachia (nec. Wagler). Steindachner, Reise d. Novara. *Uperodon* Dum. Bibr., Günther, Catal. *Cacopus* Günther, Rept. Brit. Ind.

\* Monatsberichte 1857, 55. In the same essay Prof. P. refers *Chelydrobatrachus* to *Brevipes*, erroneously, as the two genera do not enter the same families. His reference of *Myobatrachus paradoxus* to *C. gouldii* I have no doubt is correct, from my own examination of the types of the two species.

This genus is represented by two species of the Palæotropical, and two of the Neotropical region. One of the latter exhibits free toes, and metatarsal tubercles so reduced as to constitute an approximation to *Engystoma*.

*a.* Toes webbed.

*S. marmoratum* Cuvier. (*Engystoma*) *Rana systoma* Schneider, Hist. Amphib., Peters, Monatsber. Berl. 1863. *Uperodon* D. B. *Cacopus* Gthr. *Systoma leschenaultii* Tschudi. The Carnatic, India.

*S. globulosum*, *Cacopus globulosus* Günther, Rept. Brit. India. Madras.

*S. variolosum* Cope, Proc. Ac. Nat. Sci. 1866. (*Engystoma*.) Costa Rica, Central America.

*aa.* Toes free.

*S. ustum*, *Engystoma ustum* Cope, Proc. A. N. S. Phila. 1866. Guadalaxara and Vera Cruz, Mexico.

ENGYSTOMA Fitzinger, Dum. Bibron.

*Stenocephalus* Tschudi. *Microps* Wagler. "*Oxyrhynchus* (Valenc.) Guérin." *Diplopelma* Gthr., Peters, Steind.

*a.* Toes webbed.

*E. ornatum* Dum. Bibr. *Diplopelma* Gthr. Catal. Madras, India.

*E. pulchrum* Hallowell, Proc. Academy, 1862; Günther, Rept. Brit. India. (*Diplopelma*). China.

*E. disciferum* Peters, Monatsberichte, 1867 (*Diplopelma*). Java.

*aa.* Toes free.

*E. carolinense* Holbrook, N. Am. Herp. Tab. Dum. Bibr. Southern United States.

*E. ovale* Schneider, Hist. Amph. *Bufo Surinamensis* Dand. *Engystoma* Fitz., Dum. Bibr., Gthr., Steindachner, Verh. K. K. Zool. Bot. Gessel. Wien, 1864. Tab. Surinam, Brazil and Buenos Ayres.

*E. microps* Dum. Bibr. Steindachner, l. c. Tab. Brazil.

Species of this family have been artificially distributed among various genera and families. *Diplopelma*, supposed to differ in its palmate feet, is connected by species having rudimental webs, with the webbed species. *Systoma* appears to be distinct, so far as known, though the vomerine teeth supposed to characterize it are found by Günther not to exist, while the metatarsal shovels assigned to it occur in the Mexican *S. variolosum* Cope, slightly less developed, and in the *S. ustum* Cope, so reduced as to approach *Engystoma*.

## ADENOMERA Fitzinger.

Ausbeute, Rept. Novara. Steindachner, Amphib. Novara.

*A. marmorata* Fitz., Steind. Tab.*PHRYNSCIDÆ* nobis.

I. Prefrontals fully developed, forming suture with each other and fronto-parietals.

Ear perfectly developed; toes webbed; dorsum covered with a stratum of glands, . . . . . CALOPHRYNUS.

II. Prefrontals small, widely removed from each other and from the fronto-parietals.

A. Ear perfectly developed.

Two sharp-edged tubercles on metatarsus; toes little webbed; outer toe rudimental; muzzle simple, . . . . . COPEA.

No tubercles on metatarsus; toes slightly webbed, outer rudimental; muzzle simple. Two lobes of the liver, . . . . . ATELOPUS.

Tubercles of tarsus rudimental; toes slightly webbed, all well developed; a horizontal dermal process on extremity of muzzle, . . . . . RHINODERMA.

AA. Ear imperfectly developed.

Toes slightly webbed, outer small; metatarsus simple; muzzle simple; liver with two lobes, . . . . . PHRYNIDIUM.

Toes slightly webbed, no cutting metatarsal tubercles or dorsal dermal shield. Three lobes of the liver, . . . . . PHRYNSCUS.

Toes slightly webbed; no cutting tubercles; a broad dorsal osseous dermal shield, confluent with vertebral apophyses, . . . . . BRACHYCEPHALUS.

## CALOPHRYNUS Tschudi.

Batrachia, p. 86.

*C. pleurostigma* Tsch. Borneo.Var. *Sinensis*, Peters, Monatsber. 1867. China.

## COPEA Steindachner.

Verhandl. K. K. Zool. Bot. Gessel. Wien, 1864, 286.

Not having examined the sternal or cranial characters of this genus, I place it here, in accordance with the description and figure of Steindachner.

*C. fulva* Steind. l. c. Brazil.

## ATELOPUS Dum. Bibr.

Erpetologie Générale, viii. 600.

I have only been able to examine the livers of *Phrynidium læve* and *P. varium*; as the *A. flavescens* is very similar in type, its structure is probably identical with the former.

*a.* Ethmoid plate ossified to extremity of muzzle.

*A. flavescens* Dum. Bibr. l. c. Cayenne.

#### PHRYNIDIUM Martens.

Nomenclator Rept. Mus. Berolin, 1853. *Phirix* Schmidt, Denkschr. Wien, 1858, 256.

As proposed by its namer, this genus was not distinguishable from *Phryniscus*, with which it is accordingly united in Günther's Catalogue. The structure of the liver I find to be different, and though I here regard the distribution as generic, I suspect it to have a higher value, and to be of a more radical character than the peculiar atrophy of the auditory apparatus.

*aa.* Ethmoid plate cartilaginous anteriorly (in *læve* and *varium*).

*P. læve* *Atelopus* m. in Nat. Hist. Review, Lond. 1865; *Phryniscus lævis*, Gthr. Catal. 43. Tab. Panama to Chili.

*P. crucigerum* Martens, Gthr. l. c. "*Phirix pachydermus* Schmidt," Gthr. Central America.

*P. varium* Stannius (*Atelopus*), Martens Nomencl. Reptil. Mus. Berol. Central America.

*P. bibroni* Schmidt, Denkschr. Acad. Wiss. Wien, 1858, 256. Tab. Puerto Cabello.

? *P. olfersii* Martens, Nomenclator, l. c. Gthr. l. c. Brazil.

#### RHINODERMA Dum. Bibr.

Erp. Gen. viii. 657.

*R. darwini* D. B. l. c. Bell, Voy. Beagle. Chili.

It is to be observed that the *R. signiferum* of Girard\* belongs to the family Bufonidæ, having the cranial structure of *Bufo* and *Paludicola*. It must be referred to the latter genus, the supposed dermal lobe of the muzzle being entirely rudimental, and of uncertain character.

#### PHRYNISCUS Weigmann.

Nova Acta, Ac. Leop. 1834, 264. Dum. Bibron, Günther. *Chaunus* sp. Tschudi. *Hylæmorphus* Fitzinger.

*P. nigricans* Wiegmann, Dum. Bibr., Gthr., Cope, Pr. A. N. Sci. 1862, 353 (var.) Buenos Ayres.

\* Proceed. Academy, 1853, 424.



## BRACHYCEPHALUS Fitzinger.

Neue Class. Rept. 1826, Wagler, Tschudi, Dum. Bibr., Gthr. *Ephippifer* Coct. 1835.

*B. ephippium* Spix (*Bufo*) Fitzinger, Girard. *Ephippifer spixii* Cocteau. Brazil.

## DENDROBATIDÆ Gthr.

O. o. prefrontalia widely separated; ethmoid broad, ossified to extremity of muzzle; no parotoid glands or metatarsal shovel; terminal phalanges with two divaricate limbs supporting dilatations; tongue narrow, free and entire behind, . . . . . DENDROBATES.

## DENDROBATES Wagler.

Natürl. Syst. Amphib. 1830, 202, Dum. Bibr. *Hylaplesia* Gthr. Catal. (not of Boie.)

*D. tinctorius* Schneider (*Calamita*). *Rana* Shaw. *Hyla* Latreille, Daudin, Cuvier. *Hylaplesia* Boie? *Phyllobates auratus* Girard, U. S. Astron. Exp. Chile hinc *Hylaplesia aurata* Cope, fide Steindachner. Brazil, Columbia, Cayenne.

*D. nigerrimus* Spix (*Hyla*) *Dendrobates* Wagl. *Hylaplesia picta* Tschudi, Günther et *Dendr. obscurus* Guichenot, in Casteln. Anim. nov. Amer. Sud. Tab., fide Steindachner Verhandlungen K. K. Zool. Bot. Gess, 1864, 257. Brazil.

*D. truncatus* Cope, *Phyllobates* et *Hylaplesia* Cope. Proceed. Acad. 1863, 49. Central America.

*D. speciosus* Schmidt, Denkschr. Acad. Wiss. Wien. 249. Tab. Günther Catal. Andes of New Grenada, six thousand feet (Schmidt.)

*D. pumilio* Schmidt, l. c. Same habitat.

*D. lateralis* Gay, Chili, ii. p. 120, tab. 5, f. 2. *Hylaplesia* Günther, l. c. Chile.

## COLOSTETHIDÆ mihi.

Cranium fully developed; ethmoid plate broadly ossified to end muzzle, separating the narrow prefrontals. Terminal phalanges with transverse limb supporting digital dilatations; no vomerine teeth or metatarsal tubercles; tongue cylindric, free behind, . . . . . COLOSTETHUS.

## COLOSTETHUS Cope.

Proc. Acad. Nat. Sci. Phil. 1866, 130.

*C. latinus* Cope, l. c. *Phyllobates latinus* l. c. 1863, 48. New Grenada.

It is not at all certain that *Phyllobates melanorhinus* Berthold does not belong to this genus.

*RANIDÆ* mihi.

For a synopsis of the genera of this extensive family the student is referred to the Essay in Natural History Review above mentioned.

*STAUROIS ACRIDOIDES* Cope, sp. nov.

The species of *Staurois* are the present with *S. nator* Gthr., and *S. guttatus* Gthr. *Hyperolius plicatus* Gthr., referred here by me on a former occasion, pertains to *Heteroglossa* Hallowell, being the second known species. (Mus. Academy, from Ashantee.)

This species ranges in size and proportions much as *Acris gryllus* of North America. Palmation of foot not full, leaving three phalanges of the fourth toe free; terminal dilatations small. Sole with two small tubercles, a third tubercle below its middle on the inner side. Profile of front convex; canthus rostralis obtuse, straight; muzzle narrowed, rounded, slightly prominent. Diameter bony orbit equal from same to end muzzle; nostril behind end muzzle. Membranum tympani half orbit; eustachian tubes larger than the very small choanæ. Heel to middle orbit. Skin with weak tubercles above, and two plicæ convergent from orbits, then divergent and terminating behind scapulæ.

Above dark grayish olive, with frequently a narrow vertebral band; this with the plicæ and warts often black margined. A dark band on side, on front and hind face of femur, the latter with a pale one above it. Lip with three broad blackish bars, one from canthus rostralis and orbit, and two below orbit. Throat and breast brown white, punctate; abdomen white. Limbs cross-barred.

Length head and body,	13 lin.	Length tarsus,	3 lin.
“ hind limb,	19·5	Width cranium behind,	4·5
“ foot,	9		

Habitat. Zanzibar, apparently very abundant; brought to the Mus. Comp. Zoology by C. Cooke, who has explored that region. (Nos. 457, 459.)

*GASTRECHMIA*.

Maxillæ edentulous; epicoracoid and clavicle wanting; vertebræ procelian; sacrum with dilated diapophyses, attached by condyles to simple coccygeal style, . . . . . *Hemisidæ*.

*HEMISIDÆ*.

Auditory apparatus wanting; tongue posteriorly retractile into a sheath; frontoparietal and prefrontal bones fully developed, in contact, the latter separated to end of muzzle by ossified ethmoid septum; toes webbed, no cuneiform shovel; no parotoid glands; manubrium present, *HEMISUS*.

## HEMISUS.

Günther, Catal. Brit. Mus. 1858. *Cacophrynus* Steindachner.

This genus shows its nearest affines to be *Callula* and allied genera of the Engystomidæ in the wide separation of the lobes of the liver for the accommodation of the pericardial sac and its contents, and by the posterior position of the heart. In the latter point it exceeds all other genera; the heart is of relatively large size, and occupies nearly the median portion of the abdominal region. It would appear to be for the protection of this important organ that the postcoracoids are extended backwards. The cavity anterior to the heart is occupied by longitudinal muscles and the large larynx. The lobes of the liver extend each to the groin, a position even more posterior than in those genera of Raniformia which are characterized by the posterior position of that organ, and by the disappearance of its median lobe, and the wide separation of its lateral lobes for the accommodation of the heart. The genera in which this relation exists, as determined by numerous examinations, are *Breviceps*, *Engystoma*, *Systema*, *Callula*, *Phrynomantis*, *Atelopus* and *Pipa*.

This genus exhibits also an external corpus adiposum, which I have not found in *Callula*, *Engystoma*, or any other genus of Batrachia. Each one is subtriangular, the apex resting near the extremity of the postcoracoid, the body lying between the strata of the external and internal oblique muscles, along the anterior margin of the lobe of the liver on each side.

*H. guttatum* Günther, Catal. *Engystoma guttatum* Rapp, Erichson's Archiv. 1842, 290, tab.

Habitat. Natal, (Mus. Academy.)

This species possesses the posterior cartilaginous cups observed by Steindachner on the tongue of *H. sudanense*. They are probably insertions of the flabelliform retractor muscle which withdraws the extremity of the tongue into the slit behind it. The heart of this species is of unusual size.

*H. sudanense* Steind., Verh. Bot. Zool. Gess. Wien. 1864, 284. *H. guineense* Cope, Nat. Hist. Review, Lond. 1865, (no description.) *Cacophrynus sudanense* Steind., Sitzungsber. k. Acad. Wiss. Wien. vol. xlviii.

Habitat. Equatorial Africa.

## ARCIFERA.

Supplementary to the preceding, some important characteristics of the structure of the metacarpals and phalanges of certain Arciferous genera, *e. g.* Hylidæ, may be noticed.

The genus *Hyla*, as defined by the writer in "Genera of Arciferous Anura" (Journal of the Academy, 1866), embraces a number of groups readily recognized by

their physiognomy, but not distinguished hitherto by any essential characters. Some of these have received names and been regarded as genera, without any valid characters being adduced, and having in many cases a very inaccurate coincidence with the trenchant series of nature. In this catalogue come *Hypsiboas*, *Auletis*, *Hyas* of Wagler; *Lophopus* Tschudi; *Litoria* Dumeril, Bibron; *Pelodyas* Günther; and *Centrotelma* and *Hylomedusa* Burmeister, with others.

The species of *Hyla*, as above defined, appear to be referable to five genera, as follows:

I. Pollex a simple metacarpus.

- Tongue short, entirely attached; inferior palpebra latticed with fibres; vomerine teeth in series posteriorly longitudinal, anteriorly incurved, . . . . . CENTROTELMA.  
 Tongue attached, to one-third free; inferior palpebra transparent; vomerine teeth in fasciuli, or short series, which are transverse or convergent posteriorly, . . . . . HYLA.

II. Pollex a metacarpus with supplementary phalanges.

- Phalanges of pollex forming a solid elongate claw; vomerine teeth in series longitudinal posteriorly, anteriorly incurved; feet palmate; lower palpebra opaque with fibres, . . . . . CINCLIDIUM.  
 Phalanges of pollex forming a solid curved elongate claw; vomerine teeth in series longitudinal posteriorly, incurved anteriorly; feet largely palmate; palpebra transparent, . . . . . HYPYSIBOAS.  
 Phalanges of pollex two, distinct, short, obtuse, longitudinal; vomerine teeth in short transverse series; toes largely palmate; palpebra transparent, . . . . . CALAMITA.

The genus *Hyla*, as above defined, still includes *Litoria* D. B. and of other authors, as no character has yet been discovered distinguishing it trenchantly, and its species are, for the writer, only indicative of a modification within the genus toward which several other species tend. The character of the opposition of the inner digit to the others is, as Steindachner well observes, of little value, and seldom of more than specific value.

The species referable to the above genera are as follows:

<i>Cinclidium granulatum</i> Cope, sp. nov. Probably	<i>Hypsiboas pardalis</i> Spix. Brazil.
<i>Hyla langsdorffii</i> Burmeister, Erläut. Naturg. Bras. Surinam. (H. langsdorffii is an <i>Osteocephalus</i> Fitz.)	<i>palmatus</i> Latr. Brazil.
	<i>lundii</i> Burm. Brazil.
	<i>pugnax</i> Schm. Costa Rica.
<i>Hypsiboas albomarginatus</i> Spix. Brazil.	<i>calcaratus</i> Trosch. Ecuador, Guiana.
<i>levaillantii</i> D. B. Cayenne.	<i>spectrum</i> Reinhardt. Brazil.
<i>leprieurii</i> D. B. Cayenne.	<i>circumdatum</i> Cope, sp. n. Brazil.
<i>xerophyllum</i> D. B. Cayenne.	<i>cinerascens</i> Spix. Brazil.



Hypsiboas <i>indris</i> Cope, sp. nov. Surinam.	Calamita <i>cyanea</i> Daudin. Australia, New Guinea.
<i>doumercii</i> D. B. Surinam.	<i>dolichopsis</i> Cope, sp. nov. Amboina.
<i>punctatus</i> Daud. Brazil, Surinam.	Centrotelma <i>geographicum</i> Spix. Brazil, Sur.
<i>crepitans</i> Wied. Brazil.	<i>cryptomelan</i> Cope, sp. nov. Brazil.
<i>boans</i> Daud. Brazil, Surinam.	Hyla, species cognita, 76.
<i>albipunctatus</i> Spix. Brazil.	

The names adopted for the above genera are, with one exception, those employed by certain authors for species now embraced in the latter. As they were employed without discrimination of the natural genera, their re-employment is rather with the view of avoiding multiplication of names, than as a measure of justice.

It may be added that a batrachian, apparently referable to the Hylidæ, has recently been described by Dr. Steindachner (Reise du Novara 65) under the name *Ololygon abbreviatus*, supposing it to be the *Hyla abbreviata* Spix. The latter is, however, very different, being a Cystignathid of the genus *Enhydrobius* Wagl. *Ololygon* appears to be very near *Thoropa* Cope, if not the same. *Pohlia*, of the same author and work, is probably *Ranula* Peters, as defined by me, Proc. Acad. 1866, 129.

Among many new and interesting forms of Anura, mostly very well figured, the same author describes a new species of *Neobatrachus* Peters, giving it, however, another generic name, *i. e.*, the *Opisthodon frauenfeldti*; his *Helicrana* (nomen hybridum!) *grayi* is the *Platyplectrum dumerilii* Peters, too briefly described by the latter author. Another example of the vox hybrida is the name *Cyclorana*, of an interesting novelty, which with the practice of forming personal generic names, for the first time introduced to any extent into the history of the cold-blooded vertebrates, is to be condemned.

#### CRINIA STOLATA Cope, sp. nov.

The writer is acquainted with nine species of this genus, of which *C. stolata* and *C. georgiana* attain the largest size. Several of the species lack vomerine teeth and were on this account separated by Girard under the name *Ranidella*; the same type has since been named, by Sütken, *Pterophrynus*, and later, *Cumariolius*, by Peters.

Prefrontals well separated; sides and all under surfaces areolate; back without warts, but with a strong dermal fold from each supercilium approaching the other at scapulæ and following length of ilium; two other folds on each side, two converging on parietal regions and one on middle line of muzzle; two metatarsal tubercles; from end muzzle to vent between folds black; a broad dorsolateral pink brown band, and darker lateral; groin and femora carmine; below white.

In this species the posterior dorsal and sacral region is strikingly concave, owing to the elevation of the diapophyses. Tympanum not invisible, one-third orbit; nostrils as near lip as orbit. End of fore-arm measures between orbit and nostril; heel to

tympanum and end of muzzle to middle of outer metatarsus. The femora and tibiae are rugose above; a tarsal fold; soles rugulose; digits rather long, margined.

The beautiful carmine of the femur is continued on the under side of the tibia; it appears also on the outer side, and at the origin of the tarsus. Lips with a few brown spots; a pale pinkish band from orbit to shoulder. In the three preceding species, and in the *verrucosa*, there is an aggregation of minute glands at the angle of the mouth; in the *ignita* there is a similar aggregation over the scapula, which is, however, so thin as not to invalidate the distinction between this and the genus *Hyperalia*, which rests on the swollen parotoids of the latter. This and the *C. ignita* and *picta* are among the most elegantly colored of the *Salientia*.

Hab. West Australia; *Daniel*. Mus. Academy.

*CRINIA STICTIVENTRIS* Cope, sp. nov.

*Pterophrynus varius* "Peters," males, Steindachner, *Voy. Novara Amphib.* 33.

This species approaches nearest the *C. signifera* Girard and *C. affinis* Günther; it differs from the former in its very small dorsal tubercles in place of plicæ, and in coloration, especially in the lack of lateral bands; from the latter in not being smooth above, in its margined toes, and peculiar coloration above and below.

No vomerine teeth, canthus rostralis straight, obtuse. Skin areolate below, nearly smooth above, except a pair of suprascapular ridges, which are concave towards each other. A tarsal fold and two minute tubercles; sole broad, toes margined; distal extremity of tarsus to beyond nostril; sole and palm granular.

Olive gray above, with two pair brown, pale margined dorsal spots, a similar one on coccygeal region, and another concave backwards between eyes. Lip spotted; no lateral band, but a vertical spot like the others, above axilla. Below white, forming a ragged suture with the dark color of the sides; a series of black spots, forming longitudinal bars on each side the median line. Limbs cross-banded.

Length head and body,	11.3 lines.	Foot without tarsus,	5.75 lines.
Hind limb from coccyx,	17 "	Vent to knee,	4.25 "

Habitat. Australia, region not specified. No. 672 Mus. Compar. Zoology; male and female.

This species is perhaps identical with, as a variety of, the species described and figured by Steindachner in the *Voyage of the Novara*, as *Pterophrynus varius* Peters, males. The *C. varia* Pet. differs in being without areolation of the abdominal surface, and so allied to *C. lævis* Gthr. Steindachner regards this as a sexual feature, erroneously in our opinion. *C. signifera* is the species subsequently named *Camariolius pictus* Peters and *Pterophrynus fasciatus* Steindachner.

*CINCLIDIUM GRANULATUM* Cope, sp. nov.

Three outer fingers entirely webbed; skin minutely granular on upper surfaces;

head large, with acuminate muzzle and concave loreal region; a weak dermal fold on outside of fore-arm and spur on heel; reddish brown, closely marbled with lighter above; sometimes a median dorsal brown line; sides with numerous vertical brown bars; external surfaces of limbs with broad brown cross-bands; lip spotted. Large.

This species is at once noticeable for its subacuminate muzzle, concave front, and extensive palmation. The canthus rostrales are strongly marked and concave, approximated and nearly parallel for a short portion of their anterior extremity. The top of the cranium is concave. Tympanum oval, two-thirds orbit; eyes prominent, of moderate size, long diameter of fissure twice in distance from anterior border of same to end of muzzle. Skin shagreened above, with broad flat areolæ below; palmation before and behind leaving palettes only free; one-fourth of a web inside of inner finger. Incurved limb of series of vomerine teeth short, nearly approaching each other; choanæ very large, oblique, the inner fissure eight to ten times larger than ostia pharyngea. Tongue longitudinally oval. Heel to end of muzzle; longest finger to groin. No subanal flap.

	Inches.	Lines.
Length head and body, . . . . .	3	11
"    to posterior margin tympanum, . . . . .	1	3.25
Width head at posterior angle jaws, . . . . .	1	4.75
"    sacral diapophyses . . . . .		10
Length fore-limb, . . . . .	2	1.25
"    carpus and longest finger, . . . . .		12.5
"    hind limb, . . . . .	6	5
"    tarsus . . . . .	1	2.5
"    rest of foot, . . . . .	1	6

*Coloration.*—This consists of brown marblings on a pale ground. Two irregular bands converge from the orbits posteriorly, forming an interscapular patch, which is followed by numerous connected blotches to the extremity of the body; an irregular interocular band and the top of the muzzle also brown. Flanks with numerous narrow vertical brown bands between groin and axilla, which are confluent above, and surmounted by a series of broader ones. Limbs with broad brown cross-bands; the femur with four, which are split behind; the tibia with four, tarsus with two, metatarsus and toe four. A narrow vertebral brown line from end of muzzle to sacrum; below unspotted. Subanal region white, without black spot above.

*Habitat.* Surinam. One female specimen sent to the Academy Natural Sciences by Dr. Charles Hering.

This species possesses some points of resemblance to *Centrotelma geographicum*, and I suspect it has been confounded with the *Osteocephalus langsdorffi* by Burmeister. In the mouth of this species, of *Phyllomedusa scleroderma*, and



of *Hypsiboas crepitans*, I have found feathers of birds, some of brilliant colors, which the animals had mistaken for insects. Both the nareal meatus of the last named contained feathers, and one projected from each nostril, probably forced through them by the usual upward motion of the tongue in endeavoring to expel them.

The generic name is from *αγγλις*, a lattice.

*CALAMITA DOLICHOPSIS* Cope, sp. nov.

This species may be contrasted with the Australian *C. cyanea*, as follows:

Head short, truncate, covered with thickened derm; mandible not yellow

margined; hind limbs shorter, heel to orbit, . . . . . *cyanea*.

Head elongate, oval, covered with thin skin; mandible with a yellow,

below brown edged, margin; limbs longer, heel to end of muzzle and

beyond, . . . . . *dolichopsis*.

Habitat. Amboina.

This large species much resembles its congener in color and differs chiefly as above. The following measurements of two specimens of equal length of body will indicate this:

	<i>C. dolichopsis</i> .		<i>C. cyaneus</i> .	
	Inches.	Lines.	Inches.	Lines.
Length from muzzle to end coccyx, . . . . .	3	10	3	7.5
“ “ to opposite tympanum . . . . .		13		10.5
Width opposite posterior margin tympana, . . . . .	1	2.5	1	5.25
Opposite anterior canthus eye to end of muzzle, . . . . .		5.75		3.3
Arm and fore-arm, above, . . . . .	1	3.5	1	2.5
Carpus and longest finger, . . . . .	1	3	1	1
Total hind limb, from end coccyx, . . . . .	6	8	5	6
Foot (exclusive tarsus), . . . . .	1	6.75	1	5
Tibia, . . . . .	2	1.5	1	7

The glandular folds about the rictus oris are less marked in the present species than the *C. cyanea*, and the yellow mandibular margin is prolonged to over the brachium. Tympanum half orbit; tongue oval; crests of the vomer supporting teeth little elevated, less so than in *C. cyanea*. Breast derm not areolate; areolæ of sides and behind axillæ many (ten) times larger than those of abdomen. Outer web of fingers opposite end first phalanges of penultimate digit (middle, *C. cyanea*). Green color on outer metatarsus and toe only.

Museum Academy Natural Sciences, Philadelphia.

*CENTROTELMA CRYPTOMELAN* Cope, sp. nov.

Three outer fingers, half webbed; skin smooth; head broad, loreal region concave;



orbit equal length muzzle, twice tympanum; sacral diapophysis scarcely dilated; hind limb long, foot short. Above brownish-red, closely black punctate; anterior and posterior faces femur, tibia below, and band from mouth to groin, black.

This species is distinguished from the *C. geographicum* not only by its more ovate muzzle, and the singular distribution of its colors, but by the extraordinary slenderness of its extremities, and breadth and depression of its head; the diapophyses of the sacral vertebra are also less dilated than in the species of this genus and *Hypsiboas*.

The heel extends to the nares, and the tarsus is equal in length to the metatarsus and longest toe. Tibia one-half the length from end coccyx to end muzzle, two-thirds longer than coccyx. Web of foot to base penultimate phalange of fourth toe; of hand to same point of longest finger. The thumb phalange is remarkably flat and prominent laterally. Tympanum two-thirds orbit, elliptic, erect. Canthus rostralis concave, muzzle rather angulate, truncate in profile. Skin of upper surfaces and of breast entirely smooth. The extremities are colored like the back, the femur most narrowly, none cross-banded, the tibia punctate above. No dark band on loreal region. White below, belly yellow or red; both lips light margined, the mandible with a brown line within the margin.

	Inches.	Lines.
Length head and body, . . . . .	I	4.5
“ hind limb, . . . . .	2	2
“ femur, . . . . .		8
Width cranium at tympanum, . . . . .		6.75
Length “ posterior margin tympanum, . . . . .		5.5
“ fore-limb, . . . . .		9.5

One spec. No. 320, Mus. Comp. Zoology, Cambridge, from Bahia; *Antonio de Lacerda*, donor.

Allied to the *Hylidæ* by the form of the diapophyses of the sacrum, but conforming in technical features mostly with the *Pelodytidæ* is the genus.

#### GRYPISCÛS m.

Mandible with a series of caducous pleurodont teeth, and a permanent elevated tooth on each side the symphysis. Prefrontal bones fully developed, in contact with each other throughout, and with fronto-parietals. Auditory apparatus well developed; tongue broad, entire, little free. Vomerine teeth; no parotoid glands.

The mandibular teeth are obtuse, and scarcely project above the alveolar margin; their attachment appears to be to the mucous membrane only, on which account they are readily scraped away.

The affinities of this genus are as yet obscure; the mandibular teeth and general

form would refer it to the Hemiphractidæ, but the form of the sacrum separates it. The form of the cranium, with its broad outline and narrow brain-case, and of the body in general, are nearest to Pithecopsis and Cyclorhamphus, though the form of the sacrum separates it again. If referred to the Pelodytidæ, it will be the type of a group in the family characterized as follows:

Fronto-parietal bones fully developed; xiphisternum an emarginate cartilaginous shield; coccygeal style attached to two condyles; toes webbed.

*GRYPISCUS UMBRINUS* Cope, sp. nov.

General form that of *Scaphiopus holbrookii*. It bears also some resemblance to *Pithecopsis fuliginosus*, but has the vomerine chevron directed in the opposite direction, the hind limb, especially the foot, shorter, no inguinal glands, and a different coloration.

Tympanum quite small, and entirely concealed by the derm; ostia pharyngea half size of choanæ. Vomerine teeth in two arched series, which are directed backwards from the inner hinder margin of choanæ, leaving considerable interval between. Heel of extended leg to back of orbit. Width of cranium at jaws two and one-third in length head and body, twice from end muzzle to posterior third orbit, greater than length of foot without tarsus. Canthus rostralis not marked; end of muzzle oblique. Skin generally smooth, verrucose on top head, especially eye-brows. Two large tubercles on palm; large ones at digital joints, which are, with the tips of all the toes, defended by a corneous cap. A narrow cuneiform tubercle, and small external one. Toes rather short, with dermal margins, outer metatarsi bound; web well developed, three phalanges of fourth digit free. A weak tarsal fold.

General color brown, very dark on head, where there are a lighter cross-band between eyes, a light band from back part of orbit to lip, one from the front, and one from below nostril. The deep color of the head is prolonged on scapular region, also as a band on dorsal, which forks, and sends oblique band to side; dark cross-band on coccygeal region, two across tibia, and one across fore-arm. Below, and hind and front face of femur dark brown, with yellow punctæ.

Length head and body 1 in. 10.5 lines; width cranium 10 l., of interorbital region 2.75 lines; length fore-limb 11.25 l., of hind-limb 2 in. 4 l.; of foot 13.5 l., of which the tarsus forms 5 l.

A female specimen of this species was brought among the rich collections of the Thayer Expedition to Brazil, and is preserved in the Museum Compar. Zoology, Cambridge (No. 408). Rio de Janeiro.